

REMARKS

Claims 10, 11, 16-20 and 24-29 remain in this application.

By this present amendment claim 10 has been revised so as to overcome the rejection under 35 USC 112.

In the Office action the examiner rejected claims 10, 11, 16-20 and 24-29 as anticipated by Kappel et al, DE 4306073.

In making this rejection, however, it would appear that one issue the examiner has not come to grips with is that, by the amendment of October 31, 2007, claim 10 was amended to state that it is the fuel which is to be injected and burned in the engine that is also used as the hydraulic fluid. In particular, claim 10 at lines 2-3 states, "...the injector having fuel, which is to be injected into the engine to be used as the engine's fuel...". Throughout claim 10 this fuel, which eventually is injected into and used as the engine's fuel, is also the hydraulic fluid by which the actuator actuates the nozzle needle. In several places in claim 10, plus in the dependent claims, "the fuel" and/or "said fuel", is recited. Thus, the hydraulic fluid and the fuel which is injected into and burned as fuel in the cylinders of the engine are clearly recited in the claims to be one and the same.

This has been the applicants' intention for the meaning of the claim language throughout the prosecution of this application, and by the amendment of October 31, 2007, this relationship is more formally stated.

However, seal SD in Kappel et al makes sure that this is **not** the situation for their structure. Seal SD keeps the fuel and the lubricating/hydraulic oil separate. Kappel et al, at

column 4 lines 5-28, clearly state this to be the situation for their structure.

Again, the fuel and hydraulic fluid being recited in claim 10 as one and the same is in exact contrast to the disclosure and teachings of Kappel et al. The translation of column 4 lines 5-28 of Kappel et al clearly state that “The hydraulic region is fully encapsulated and is separate from the fuel circuit by a sealed valve tappet leadthrough SD.” Clearly by the statements of Kappel et al, Kappel et al is not a valid teaching of the structure which is recited by claim 10.

On page 8 of the Office Action the examiner has mistakenly indicated that the fuel injection valve is disposed in chamber KA1 of Kappel et al. But the fuel injection valve in Kappel et al is **not in chamber KA1**, it is at EO, which is clearly outside KA1. Kappel et al very specifically maintain separation of KA1 from injector EO by seal SD.

The examiner also indicates that oil in KA1 operates under fuel injection pressure from vessel SP through bore GB. Applicants strongly disagree with this statement by the examiner and point out that the pressure in KA1, or any of the other locations where oil from SP might be found, is not at injection pressure, but rather is at the same pressure as the engine oil pressure supplied from SP. This engine oil pressure from SP is nowhere close to being of sufficient pressure to supply a fuel injection. Again, seal SD assures that the pressure within hydraulic chambers KA1, KA2, and KA3 are not at the injection pressure of injector EO.

Claim 10 recites the injector body and the nozzle body as separate elements of structure. The claim goes on to recite that the booster piston is guided in the nozzle body. Kappel et al have these two elements combined as one element.

This last argument is even more applicable for claims 27-29 which recite the specifics of a gap between the union nut and the nozzle body, plus the machined recesses within the nozzle body which form a communication channel between the annular chamber and the cylindrical pressure chamber. Fussner and Bart both have union nuts, but do not have, or in any way teach, that it would be obvious to provide a gap such as recited in these claims. And even further, none of the references have a machined recess which forms a communication channel, particularly not a communication channel as recited in these claims.

It is again pointed out that the examiner has inaccurately indicated as part of his 102 rejection, midway in the first paragraph of page 4 of the Office action, that SP is the fuel supply in Kappel et al. But this is clearly **not** correct. In Kappel et al the fuel supply for the engine is at KRZ. SP is a supply for engine oil, which in the injection device of Kappel et al is used as hydraulic fluid. SP does not supply fuel to be injected and burned by the engine. It cannot be overemphasized that Kappel et al clearly state that seal SD maintains the engine fuel completely separate from chambers KA1, KA2, and KA3, and thus completely separate from the hydraulic oil. In Kappel et al SP is a storage means for a hydraulic fluid, which is entirely different from being a supply for the fuel. As shown in figure 9 of Kappel et al, the reservoir of hydraulic fluid can be oil from the engine, but it is not the engine fuel.

As a technicality, the examiner may be correct that engine oil could be used as a fuel. But this technicality is not a teaching of such, and it is especially not a teaching of how an invention should be arranged to obtain such a result. The claim language of claim 10 specifically recites that the hydraulic fluid is the engine fuel and recites structure which

makes this happen, whereas the structure of Kappel et al, particularly by seal SD, **specifically keeps the engine oil**, and thus the hydraulic fluid, **separate from the engine fuel**. Thus, clearly the structure of Kappel et al cannot be read on the invention as recited in claim 10.

A further distinction between the Kappel et al reference and the structure as recited in claim 10 is that in claim 10 the piezoelectric actuator is centered in an annular chamber 17, the inner chamber 31 communicates with the annular chamber 17, and both the annular chamber 17 and the inner chamber 31 are subjected to fuel at injection pressure. As a result, the piezoelectric actuator and part of the booster piston 31 are surrounded by fuel at injection pressure. **This simply is not true for Kappel et al.**

In the Kappel et al reference, fuel is supplied by means of KRZ and is delivered at injection pressure **only** to the nozzle needle pressure chamber that surrounds the nozzle needle. The engine fuel is kept entirely away from the annular chamber and inner chamber by means of a seal (SD).

Chamber KA3 of Kappel et al is not filled by fuel at injection pressure, but rather is filled by hydraulic oil from a separate hydraulic supply GB, and/or accumulator SP, see Kappel et al for example at figure 9, or other figures where SP is some other form of oil storage means, none of which supply the oil at injection pressure. In Kappel et al, chamber KA3 is supplied from a source which is different from fuel supplied at KRZ, and thus at a different pressure. It is not supplied with engine fuel and is **not** at injection pressure, as is recited for applicants' chamber 31 in claim 10.

And in even further distinction to the structure recited in claim 10, the chamber KA2 in Kappel et al, which corresponds to the inner chamber 31 in the present invention, is filled from the chamber KA3 via the conduit BH. Consequently, the chamber KA2 is likewise not subjected to fuel at injection pressure. Thus in Kappel et al the piezoelectric actuator P and the chamber KA2 are not subjected to fuel at injection pressure. Rather, these chambers are supplied with hydraulic fluid via bore GB. This is entirely contrary to applicants' claim 10 where **the fuel used by the engine as fuel** is supplied to these areas **at fuel injection pressure**.

Thus again, clearly the reference to Kappel et al does not teach, or does it in any way make obvious, the structure which is recited in present independent claim 10. Neither does Kappel et al teach, nor in any way make obvious, the invention which is recited in the claims which depend on claim 10.

In the Office action the examiner added a rejection of claims 10, 16, 17, 28 and 29 as unpatentable over Kappel et al in view of Bart and Fuessner. But these additional references to Bart and Fuessner do not add any structure or teachings which, as pointed out above, are missing from the base reference to Kappel et al.

Bart, as recited by the examiner, teaches a compression spring concentrically surrounding a booster piston and braced by a collar of the booster piston. But this has nothing whatsoever to do with the structure which, as pointed out above, is lacking from the Kappel et al reference. More particularly, this teaching from Bart does not supply any hint of supplying the annular chamber which surrounds the piezoelectric actuator with fuel from the

fuel supply, and certainly not fuel at the injection pressure. Nor does this reference to Bart in any way teach that the inner chamber 31 should communicate with the annular chamber.

Accordingly there is no way that the reference to Bart can be considered as supplying the teachings which are missing from the base reference to Kappel et al. Thus the combination of Kappel et al and Bart does not make for a proper rejection of the claims of this application.

Likewise, the reference to Fuessner does not teach anything which makes obvious these features which distinguish the claimed structure from Kappel et al. In particular, while Fuessner shows the use of a union nut, this is not a teaching of supplying the annular chamber, which surrounds the piezoelectric actuator, with fuel which is at injection pressure. And Fuessner does not supply any teaching of an inner chamber, such as applicants' chamber 31, and certainly Fuessner does not have any teaching of filling such inner chamber with fuel from the annular chamber.

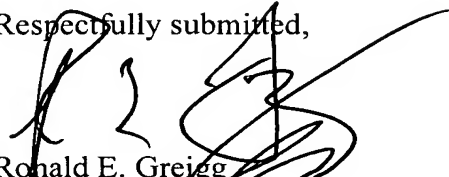
For the above reasons it is believed that claim 10 patentably distinguishes over all of the cited prior art, and that all of the examiner's objections and rejections have been overcome.

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Accordingly, entry of this amendment and allowance of all of the claims are
courteously solicited.

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Respectfully submitted,



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